Chapter 7

7. PHYSICAL NATURAL RESOURCES AND CLIMATE

7-1 Topography

Fort Wainwright lies north of the Alaska Range, within the drainage of the Tanana River. The Main Post and TFTA lie within the Tanana-Kuskokwim lowland. This depression was subsiding as the Alaska Range was rising to the south, and filling with sediments from those mountains. The area is bounded by uplands to the north, the Alaska Range to the south, and consists of alluvial fans extending northward from the mountains. The Tanana River flows along the northern edge of the lowland. The terrain is generally flat lowland, ranging from 128 to 512 feet above sea level (Nakata Planning Group, 1987). Gradients range from 40 to 50 feet/mile along upper portions of fans, to 6 to 7 feet/mile in the Tanana Flats (Racine et al., 1990).

YTA lies within the Yukon-Tanana Uplands, consisting of rounded, even-topped ridges with gentle side slopes, broad divides, flat-topped spurs, and gently sloping plains. Ridges occupy nearly 10 percent of the area, oriented in a northeast-southwest direction (Bonito, 1980). Elevations range from 192 to 3,285 feet. Figure 7-1 shows topography of Fort Wainwright.

7-2 Geology

Central Alaska has not been glaciated, but during glacial advances, glaciers surrounded the area. Climatic fluctuations during the Quaternary Period caused glacial expansion and recession (Racine and Walters, 1991). Rivers flowing from glaciers deposited several hundred feet of silt, sand, and gravel in the Tanana and Yukon valleys. Most of the area is covered by a layer of loess ranging from several inches to more than 128 feet thick. Gravel deposits along the Tanana River are up to 154 feet thick and are a significant source of groundwater (Nakata Planning Group, 1987).

Bedrock of the Yukon-Tanana Uplands, including most of YTA, is characterized by a complex assemblage of Precambrian and Paleozoic-age metamorphic rocks of the Yukon-Tanana crystalline complex (formerly known as the Birch Creek schist). These rocks were later intruded by Cretaceous and Tertiary-age igneous rocks, resulting in a few exposed areas of granite and quartz diorite. Silty micaceous loess, derived from outwash plains south of the Tanana River, was deposited over most of the area during the Pleistocene and Holocene. Some areas are covered by Quaternary deposits, with the most recent deposits occurring along stream valleys in the form of well-stratified gravel, sand, and silt (BLM and U.S. Army, 1994).

7-3 Seismicity

Even though seismic activity in Alaska exceeds that of any other state, few shocks have caused severe damage due to the absence of large population centers. Fort Wainwright lies in a 200-mile wide seismic zone that extends from Fairbanks southward through the Kenai Peninsula. Since the 1960s, several minor seismic events have occurred east of the main cantonment area and along the western boundary of the Tanana Flats. There is no record of damage sustained from these events (Nakata Planning Group, 1987).

7-4 Petroleum and Minerals

Mineral resources management on YTA and TFTA on Fort Wainwright is the responsibility of the BLM. YTA is exempt from provisions of the Mining Law of 1872, the Mineral Leasing Act of 1920 as amended, the Mineral Leasing Act for Acquired Lands of 1947, and the Geothermal Steam Act of 1970. The withdrawal is closed to all forms of mineral material disposal, both sale and free use, other than that which supports military activity (BLM and U.S. Army, 1994).

Measures to safeguard resource values outlined in 43 CFR 3100, 43 CFR 3600, and 43 CFR 3809 apply to mineral development on withdrawn lands. Under terms of the Military Lands Withdrawal Act of 1986, should withdrawn lands be opened to mineral location, mineral patents could convey title to locatable minerals only. These patents would also carry the right to use as much of the surface as necessary for mining under guidelines established by the Secretary of the Interior by regulation (BLM and U.S. Army, 1994).

YTA has a low potential for oil or gas deposits, and no known potential for coal and oil shale. YTA has no potential for concentrations of phosphate, sodium, potassium, or gilsonite, and moderate potential for geothermal resources (BLM and U.S. Army, 1994).

There has never been significant mining activity on YTA, and the area has been closed to mineral exploration since the 1950s. Placer mining has occurred south and east of YTA, and portions of YTA have a moderate to high potential for gold and tin deposits (Center for Ecological Management of Military Lands, 1998). Historic placer mines are reported on Beaver Creek and Pine Creek. Records of the State of Alaska show a claim staked on a tributary of French Creek in the southwestern part of YTA. No valid claims exist now.

The *YTA Resources Management Plan* (BLM and U.S. Army, 1994) prohibits mining in drop zones and landing fields, and within one mile of all existing roads and major trails, to maintain safe military operations and training. Mineral material sites are an exception to the one-mile off-limits designation. The military may use sand and gravel for its own purposes. Large amounts of sand and gravel are available just west of YTA, and there is high potential for localized sand and gravel in some stream valleys on YTA (BLM and U.S. Army, 1994).

7-5 Soils

Knowledge of soil characteristics and classification forms the foundation for establishing effective management and rehabilitation programs for natural resources. A comprehensive soil survey for Fort Wainwright has not been completed. Fort Wainwright needs soils information to plan future development. For example, permafrost can create significant problems for construction and military activities, but permafrost cannot be mapped without soil data. USFWS has stated concern over the effects of erosion on wetland. Soils information could be used to determine risk levels.

A soil survey exists for the cantonment area of Fort Wainwright, but its accuracy and detail is inadequate for the needs of the installation. Most of the cantonment area is Chena alluvium, an unconsolidated silt-gravel mixture. Discontinuous permafrost lies just under the surface in some areas. The unconsolidated silt-gravel mixture freezes perennially. It has a high bearing strength when frozen, but is subject to sliding and is difficult to compact when thawed. Northernmost portions of the post are in the foothills of the Yukon-Tanana Upland and consist of bedrock covered by muck and loess. Muck inhibits drainage, largely due to the presence of impermeable permafrost below the surface, and has very low bearing strength when thawed. Swale deposits, made up of poorly stratified silt, sand, and organic matter, are scattered along the Richardson Highway and in parts of South Post. These deposits have high ice content and freeze perennially (Nakata Planning Group, 1987).

TFTA comprises different units of unconsolidated material, distributed in broad basins and elongated meander scars. Deposits grade from coarse gravel at heads of fans nearest the Alaska Range, to sand and silt at the bases of fans in the northern part of the basin. Coarse sediments on upper fans are well drained, but fine-grained sediments of lower fans are poorly drained. Frozen ground is within 20 inches of the surface in places and nearly 128 feet thick. Permafrost is absent beneath rivers and lakes, but is common wherever surface water or circulating groundwater is absent (Racine et al., 1990).

Soils on YTA have been mapped at a broad exploratory level of survey. South slopes consist of well-drained silt loams and are generally free of permafrost. Loams grade from shallow, gravelly silt near ridge-tops, to silt loams on mid-slopes, to deep, moist silt loams on lower slopes. Drainage bottoms and depressions are occupied by shallow, gravelly silt loam covered with a thick layer of peat and underlain by permafrost. Soils on north-facing slopes are shallow, gravelly silt loams with thick covers and permafrost (BLM and U.S. Army, 1994).

A comprehensive soil survey was completed in 1998. Details on this survey can be found in Section 12-2a.

7-6 Water Resources

7-6a Surface Water

Fort Wainwright's surface water resources are diverse and include numerous rivers, streams, ponds, and lakes (see Figure 7-6a). The Tanana and Chena rivers drain Main Post. TFTA is drained by several streams: Wood River, Crooked Creek, Willow Creek, Clear Creek, McDonald Creek, and Bear Creek among them. All drain into the Tanana River directly, or by way of Salchaket Slough. Northern and northeastern portions of YTA are drained by the Chena River and its tributaries: the South Fork Chena River, Hunts Creek, and Horner Creek. The southern portion of YTA is drained by the Salcha River and its tributaries: Ninety-Eight Creek, Redmond Creek, and McCoy Creek. Streams draining the western portion of YTA flow directly, or by way of Piledriver Slough, into the Tanana River. All streams originating on YTA have their headwaters in the Yukon-Tanana Uplands, in rolling glacier-free terrain (BLM and U.S. Army, 1994).

The volume of flow fluctuates dramatically by season. During the long period of freeze, usually from October to May, flow is limited to seepage of groundwater from aquifers into streams. Many small streams freeze solid (zero discharge) during winter. Snowmelt typically begins in May and reaches its peak in June. Flow is greatest during June and July. By the end of July, most snow has melted, and a steady flow during August and September is sustained by rainfall. The Chena River is primarily nonglacier-fed and reaches peak flow before the Tanana River, which is fed by meltwater from glaciers and snowfields in the Alaska Range (Nakata Planning Group, 1987).

Surface water quality on YTA is generally good. The Chena River, from the Chena Slough to the confluence with the Tanana River, has been classified by the state of Alaska as Class A (suitable for agriculture, aquaculture, and industrial), Class B (suitable for water recreation), and Class C (suitable for growth and propagation of fish, shellfish, other aquatic life, and wildlife). The pH of the Chena River is slightly above neutral during winter and slightly below neutral in summer. Nitrogen concentration is high in relation to phosphate, which may be the limiting inorganic nutrient for phytoplankton production. Only naturally occurring iron concentrations were higher than the secondary state standards. The high iron concentration in the lower portion of the Chena River may be the result of surface water and groundwater discharge from swampy, muskeg areas in this region. Sediment loads are generally low. Nonglacier-fed streams generally carry less than 300 mg/l during high flow and as little as 10 mg/l during low flow periods (BLM and U.S. Army, 1994).

Lakes and ponds are scarce on Fort Wainwright, and many freeze solid during the winter. Only a few are stocked by ADF&G. Blair Lakes are the largest lakes on TFTA.

7-6b Groundwater Resources

Much of Fort Wainwright is underlain by an alluvial aquifer. Groundwater in the aquifer is recharged by the Tanana River, while the Chena River and direct infiltration of precipitation contribute small amounts. Groundwater potential is best along the alluvium of the Tanana River, where wells are capable of yielding 3,000 gallons per minute (gpm) at less than 200 feet in depth. The lowest potential is in the rolling hills of the YTA, where wells produce around 50 gpm at the same depth (Nakata Planning Group, 1987).

Groundwater in the Fort Wainwright area tends to have relatively high, naturally occurring levels of metals, especially iron and arsenic. Elevated arsenic levels are prevalent in the upland areas. These are not related to human-caused pollution (Harding Lawson Associates, 1996).

Due to past contamination of localized areas, mostly within the cantonment area, Fort Wainwright is classified as a Comprehensive Environmental Response, Compensation, and Liability (CERCLA) “Superfund” site. Remediation is ongoing.

7-7 Climate

Fort Wainwright has the northern continental climate of the Alaskan interior, which is characterized by short, moderate summers; long, cold winters; and little precipitation or humidity. Weather is influenced by mountain ranges on three sides, which form an effective barrier to the flow of warm, moist, maritime air during most of the year. Surrounding uplands also cause settling of cold, Arctic air into Tanana Valley lowlands.

Average monthly temperatures in Fairbanks range from -11.5°F in January to 61.5°F in July, with an average annual temperature of 26.3°F. The record low temperature is -66°F, and the record high is 98°F. The average frost-free period is 95-100 days.

Prevailing winds are from the southwest in June and July, and from the north and northeast in winter. Average wind velocity is 5.3 miles per hour (mph). The greatest average wind speed is in spring, with a high of 40 mph recorded in Fairbanks. Winds are 5 mph or less 60% of the time. Thunderstorms are infrequent, occurring only during late spring and early summer.

Average annual precipitation is 10.4 inches, most of which falls as rain during summer and early fall. Average monthly precipitation ranges from a low of 0.29 inches in April to a high of 1.86 inches in July. Average annual snowfall is 67 inches, with a record high of 168 inches during the winter of 1970-71. Average annual relative humidity is 55%, with lowest levels during spring and early summer (38% during mid-afternoon in May). Heavy fog is relatively common during December and January, with four or five foggy days each month. Ice fog can be expected anytime temperatures drop below -30°F, but is normally restricted to areas near human settlements where moisture is emitted from burning fuels (Bonito, 1980).